Name:

at1117paper: Complete the Square (v330)

Example

A square's edge length is x feet. A rectangle has a height of x feet and a width of 42 feet. Their combined area, found by adding the square's area and the rectangle's area, is 1159 square feet. What is the value of x?

Example's Solution

$$x^2 + 42x = 1159$$

To complete the square, add $\left(\frac{42}{2}\right)^2 = 441$ to both sides.

$$x^2 + 42x + 441 = 1600$$

Recognize the left side is now a perfect-square trinomial. Factor the left side.

$$(x + 21)^2 = 1600$$

Undo the squaring.

$$x + 21 = \pm\sqrt{1600}$$

$$x + 21 = \pm 40$$

Subtract 21 from both sides.

$$x = -21 \pm 40$$

In this geometric example, we are only concerned about the positive solution. So,

$$x = 19$$

Question 1

A square's edge length is x feet. A rectangle has a height of x feet and a width of 50 feet. The total area, of the square and rectangle, is 1491 square feet. What is the value of x?

$$x^2 + 50x = 1491$$

$$x^2 + 50x + 625 = 2116$$

$$(x + 25)^2 = 2116$$

$$x + 25 = \pm 46$$

$$x = 21$$

Question 2

A square's edge length is x feet. A rectangle has a height of x feet and a width of 50 feet. The total area, of the square and rectangle, is 1224 square feet. What is the value of x?

$$x^2 + 50x = 1224$$
$$x^2 + 50x + 625 = 1849$$
$$(x + 25)^2 = 1849$$
$$x + 25 = \pm 43$$
$$x = 18$$

Question 3

A square's edge length is x feet. A rectangle has a height of x feet and a width of 44 feet. The total area, of the square and rectangle, is 672 square feet. What is the value of x?

$$x^2 + 44x = 672$$
$$x^2 + 44x + 484 = 1156$$
$$(x + 22)^2 = 1156$$
$$x + 22 = \pm 34$$
$$x = 12$$